SCIENCE.

FRIDAY, FEBRUARY 20, 1885.

COMMENT AND CRITICISM.

We are glad to learn that the Bureau of scientific information of the Philadelphia academy of natural sciences, the organization of which was briefly noticed in these columns last autumn, is already in successful operation. It is no small sacrifice upon their part when a score or more of busy specialists volunteer to receive and answer, without charge, reasonable inquiries in their several departments. It should be remembered, that while many persons are well enough informed to know to whom to write, and are courageous enough to do it, others, from the want of such information, from modesty, from fear of trespassing upon the time of those to whom they would gladly write, or from anxiety lest their request might meet with inhospitality and rebuff, are led, in fact, to refrain from questioning, and become eventually contented with ignorance, or, worse yet, half-knowledge. To mention but a single one of the many excellent features of this scheme, viz., bibliography, we need not say what a boon it will certainly be to some one, far removed from monographs, to feel free to consult Dr. Nolan, librarian of the academy, assured beforehand of his cordial co-operation.

We are pleased to note that the views regarding the proper functions of agricultural experiment-stations, which have been advanced in recent numbers of *Science*, have found independent expression in a report to the regents of the University of Nebraska by Prof. C. E. Bessey, dean of the industrial college. His report includes a plan for experimental work in agriculture, horticulture, and entomology; which plan, we are informed, has been adopted by the regents. It provides for two classes of experiments, designated as 'popular' and 'scientific;' the first designed to reach immediate results, and the second to establish general principles. Professor Bessey does not fail to attach due value to 'popular' experiments, but he points out two facts which seem to be frequently forgotten by those who make such experiments.

The first is, that while such experiments may often be of great immediate value, they are usually so only within narrow limits of both space and time, while a scientific principle, if once actually established, is true at all times and under all conditions. The second fact is, that many experiments of this character are constantly being made by private enterprise in all parts of the country. This is particularly the case with tests of new varieties of plants and new patterns of machines. Scientific experiments, on the other hand, demand special training and apparatus, such as private enterprise does not usually command; and it is therefore especially important that experiment-stations and colleges which have the facilities for such experiments should be encouraged and supported in undertaking them to as great an extent as may appear practicable in each particular case.

The knowledge of thunder-storms is advancing at a good pace. France has made special study of them for a number of years; Bavaria and Belgium have more recently taken them up; and last summer they were made the subject of special investigation by our signal-service, with the aid of a large corps of voluntary observers, that is to be continued during the coming season. A recent report by Lancaster, on the storms of 1879 in Belgium, confirms the conclusions previously announced there, and discovered to obtain so clearly in this country, that thunder-storms occur only in the south-east quadrant of the barometric depressions, or great cyclonic storms that frequently sweep across temperate latitudes.

But there still remains to be found the actual mechanism of thunder-storms, concerning which various more or less theoretical opinions have been published. The matter will probably remain in doubt until settled by the same kind of investigation that demonstrated the inward spiral path of cyclonic winds. Synoptic charts for a stormy afternoon, with hourly or even half-hourly intervals, and stations only a mile or two apart, would probably settle the question beyond dispute; and the first local weather service that succeeds in preparing a set of such charts will gain a prize worth working for.

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The incandescent light on steamers.

THE instance cited in No. 104 of *Science*, of early electric lighting of steamboats by the incandescent system, though earlier than that given by Professor Trowbridge, is not the earliest.

I crossed the Atlantic in May, 1882, in the steamer City of Richmond, of the Inman line, which was beautifully lighted by the incandescent system. It is my impression that the lamps were of an English make, the form of the carbon filament being somewhat different from that then used by Edison and other Americans. C. H. AMES.

Chopping-stones.

It is not improbable that the implement figured in a recent article by Miss Babbitt (iv. 529, fig. 3) could have been used as a fuel-breaker, when fastened in a wooden and hide handle; but a more evident use for such notched pebbles, namely, as net-weights, is seen in an industry of the present day among the gill-net fishers, both Indian and white, of the Great Lakes. Net-weights of this character are produced in large quantities at all points on the lakes where gill-netting is in vogue, forming frequently a part of the ballast in the bottoms of the 'Mackinaw' fishing-boats, and lying conspicuously scattered over the sand and beach in the neighborhood of fishing-stations. A less primitive appliance for sinking the nets is coming into use; so that the notched discoidal pebbles, attached to the net with short pieces of twine, are now regarded as old-fashioned by the more thrifty fishermen. The unnotched pebble net-weights, bound with bark, of the Red-Lakers, are interesting as a still more primitive form; but more extended observation in gill-net appliances would have shown Miss Babbitt that the notched form is of far more usual occurrence than she leads us to suppose, and that it possesses tons of examples on the shores of the Great Lakes.

I have found such implements associated with the remains of recent Indians (chert chippings, broken pottery, etc.) in the sand-dunes at Evanston. The modern net-weights are distinguishable from those of the chert deposits in only one particular, that while the surfaces of the former are smooth, and their notches rough and angular, those of the latter show on their surfaces the effects of disintegration from long exposure on the sand to atmospheric agencies, their notches, too, having assumed the same crumbling character as the rest of the pebble. A large number of them (over twelve) which came to my notice at one place indicates their use as net-weights rather than as 'chopping-stones.' W. A. PHILLIPS.

Evanston, Ill.

The use of slips in scientific correspondence.

I have been interested in Mr. Mann's and other articles on filing scientific notes.

Any one wishing to file such notes will find that a very convenient method of doing so is by the use of the Shannon file, which may be found at any large stationery store. The punch for punching the holes through the paper is the most convenient I have seen, as the holes are always the same distance apart, and at the same distance from the edge.

S. P. SHARPLES.

The decadence of science about Boston.

In a late issue (No. 104), *Science* comments upon the decadence of science about Boston. Is it not an explanation of this decadence that more and more in late years the mental atmosphere of Boston has become one of intellectual finish, rather than of intellectual earnestness? Of course, each of these traits has its excellences, as each may be exaggerated; but the latter of the two certainly is far more favorable to the active growth of science in a community. Moreover, the effect of an intellectual atmosphere becomes most evident when it has begun to influence the lives of young men grown up in its midst, and who take their cue in life from it. Is not this effect to be noticed in the present case? X. C.

Koch's 'comma bacillus.'

In the reproduction of the drawing of the 'comma bacillus,' made to illustrate my paper in *Science* for Feb. 6, some defects are noticeable, to which it seems necessary to call attention, inasmuch as the design was to represent as accurately as possible the morphology of this much-talked-of micro-organism. The ends of some of the commas in the figure seem to be cut off square, whereas in the slide and in the drawing they are all rounded. Since writing the paper referred to, I have been favored by Dr. Koch with a slide of the 'comma bacillus,' in which the long spiral forms are far more numerous than in the slide sent to the Army medical museum, from which the drawing was made. Several of these spiral filaments are often seen in a single field, and many of them are longer than that seen in the centre of fig. 1.

GEO. M. STERNBERG, *surgeon U.S.A.*

Johns Hopkins university, Baltimore,
Feb. 11.

Carnivorous habits of the muskrat.

My observations of these animals were conducted principally along the banks of the Alleghany River in the vicinity of Warren, Penn., where these enemies of fresh-water bivalves are very numerous.

1°. The muskrat opens the shell by first severing the posterior adductor muscle. This can readily be accomplished, as the animal seldom immediately empties the branchial chamber after capture, but remains with the valves slightly gaping, with the siphons open, until it receives quite severe handling, upon which the water in the branchial chamber is violently ejected. The valves will also partially open if the

shell is allowed to remain untouched for some time, as if the animal was trying to acquaint itself with its new surroundings. After one adductor is severed, the valves open, so that the other may be easily reached.

2°. I have often seen the posterior margins of the valves slightly notched, and the epidermis scratched, from the efforts of the muskrat to open the shell.

3°. The shells are never opened by tearing away the hinge-ligament, although this portion is sometimes injured.

4°. During the winter season the shells were deposited, often many bushels, upon the edge of the ice which fringed the shores. This offered an explanation to me for the large quantities of dead shells which I had frequently noticed in certain localities at the bottom of the river.

5°. With the mussels in the muskrat shell-heaps were many flat stones, gathered for the purpose of eating the algae growing upon them.

6°. Among the species eaten by the muskrats of the Alleghany River may be mentioned the following as of the most frequent occurrence: Unio ligamentinus, U. phaseolus, U. gracilis, U. patulus, U. clavus, U. crassidens, U. occidens, U. ovatus, U. luteolus, U. gibbosus, Margaritana rugosa, M. marginata, and Anodonta edentula.

CHAS. E. BEECHER.

Albany, N.Y., Feb. 9.

I have been familiar, ever since my boyhood, with the fact that these animals live largely upon the mussels and other shell-fish of our rivers and creeks. It is also well known to duck-hunters, at least in this region of country, that they pick up no inconsiderable portion of their subsistence from dead and wounded birds found by them after the sportsman has abandoned the search. Only last spring I killed a duck in this vicinity which fell out of reach and floated off. Upon recovering it within less than an hour afterwards, on the farther shore of the 'slough,' its breast had already been eaten away by a muskrat; and it is no uncommon occurrence to surprise them at such repasts.

THEO. S. CASE.

Kansas City, Mo., Feb. 9.

If those interested in the carnivorous habits of the muskrat will refer to *Science*, No. 62, they will find there a notice of a discussion upon this subject, which took place before the Biological society of Washington in the spring of 1884. In regard to the fact that piles of *unbroken* Unio shells are found near muskrat burrows, it seems to me that there can be but one explanation, and that is the suggestion made at the Biological society, that the shells are gathered by the muskrats, piled up, and left out of water until too weak to keep their shells closed, when the rodent finds it an easy matter to pick out the meat.

RALPH S. TARR.

Cambridge, Mass., Feb. 6.

JOHN GWYN JEFFREYS.

THE ranks of English naturalists have met with a serious loss in the death of John Gwyn Jeffreys, LL.D., F.R.S., etc., which took place suddenly at his residence, Kensington, on the 24th of January.

Dr. Jeffreys was born at Swansea, Jan. 18, 1809, and at the time of his death, with the exception of Sir Richard Owen, was probably the oldest British naturalist. Up to the last he was busily engaged on the investigation of the deep-sea dredgings of the Lightning and Porcupine expeditions; and, only three days before the reception of the news of his death, a copy of a recent paper on the relations of the American and European mollusk faunae was received from him.

Dr. Jeffreys was the descendant of one of the oldest families of Wales, and was called to the bar at Lincoln's Inn. For many years, however, he had retired from practice, and had been devoted to the investigation of the natural history of mollusks, especially those of the British islands, northern Europe, and the adjacent seas. His work on the British mollusca is the standard book of reference on that topic, and his investigations into the fauna of the deep sea were known and appreciated among men of science everywhere.

Dr. Jeffreys, from a lad, had been a student of conchology, devoting his holidays to collecting, and was among the earliest, most energetic, and persistent dredgers of the British seas. In his earlier days he was intimately acquainted with that classical band of British naturalists to whom science owes so much, and who toiled for the most part unappreciated. In later years he was equally active, and participated in the important expeditions of the Lightning, Porcupine, Valorous, etc., and was only prevented by an accident from participation in the voyage of the Challenger. His first important paper was published by the Linnean society in 1828; and since then hardly a year has passed by without contributions from his pen, many of which were printed by the Royal society, of which he was for forty-five years a fellow. The extent and importance of his researches can only be fully appreciated by specialists engaged in similar studies. He was president of the biological section of the British association in

1877, and held the office of high sheriff of Hertfordshire and other important public trusts at various times. He was treasurer of the Geological society for many years, and honorary or corresponding member of many foreign societies.

In scientific matters, Dr. Jeffreys had something of the conservatism natural to a person of his years; but his opinions, however firmly held, were never expressed with bitterness, and his geniality and hospitality bound to him in friendly ties not only scientific men, young and old, but the intelligent and cultured throughout his wide circle of acquaintance. He leaves a son, Mr. Howel Jeffreys, and five daughters, one the wife of Prof. H. N. Moseley of the Challenger expedition. His collection, which for British seas is absolutely unrivalled, possessing many of the actual types of Turton, Alder, and other early British naturalists, and an extremely rich and largely unique North Atlantic and North European series will form one of the treasures of the National museum at Washington, where a portion of it has already been received. W. H. DALL.

THE WASHINGTON NATIONAL MONUMENT.

THE history of the undertaking which has resulted in the completion of the Washington monument presents a number of interesting and curious facts; and the construction of the monument itself, by reason of the magnitude of the structure, has involved some problems of considerable engineering importance.

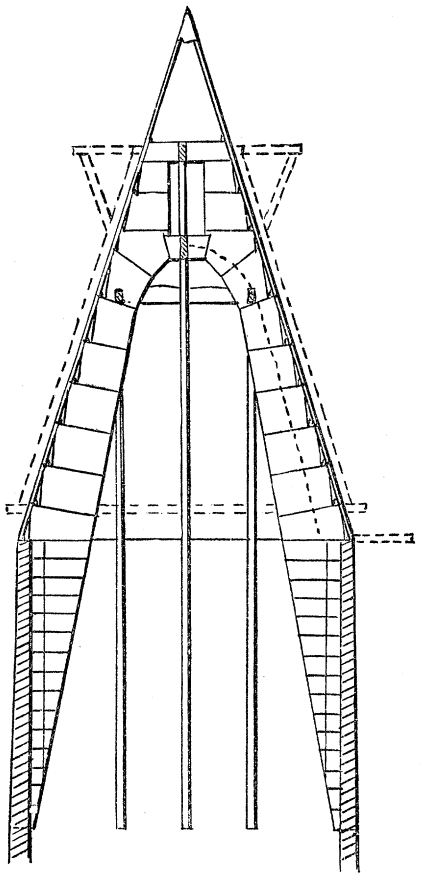
The early history of the monument may be said to date from 1783, when congress resolved to erect, wherever the residence of congress should be established, an equestrian statue of Washington; and in 1795, when it was proposed to build a monument commemorating the American revolution, Major L'Enfant, the designer of the plan by which the city of Washington is laid out, selected, and Gen. Washington himself approved, the site where the finished monument of which we write now stands.

After the failure of these and other similar plans, the next step was taken in 1833, when, under the auspices of the Washington national monument society, the aid of the people of the United States was invoked to raise the sum required to erect a great national monument, no one to contribute more than one dollar, — a restriction which was removed in 1845. Money came in slowly; but by 1847, $87,000 had been raised, and it was determined to make a beginning; and, by authority from congress, President Polk deeded the present site to the society. Building was at once commenced, but proceeded slowly; and in 1854 the society had spent $230,000, and raised the monument to a height of 152 feet above the base.

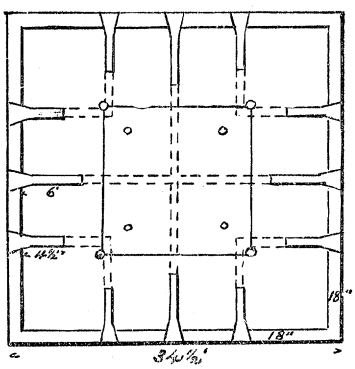
The original design by Robert Mills included an obelisk faced with white marble, 600 feet high, 55 feet square at the base, and 30 feet square at the top, surrounded at its base by a circular rotunda or colonnade 250 feet in diameter and 100 feet high, in which were to be placed statues of the nation's illustrious dead, with vaults beneath for the reception of their remains.

The base or foundation masonry was about 80 feet square at the bottom, laid at a depth of but eight feet below the surface of the ground, and carried up, in steps of about three feet rise, to a height of 25 feet, where it is 58 feet square. The slight depth to which the foundation was carried was due to the anxiety of the building committee to have something to show for the money expended. It was built of rubble masonry of blue gneiss, the blocks large and of somewhat irregular shapes (nearly as they came from the quarry), laid in a mortar of hydraulic cement and stone lime, the joints and crevices filled and grouted. The shaft of the obelisk was built hollow, with walls 15 feet thick at the base; the well, or hollow interior, being 25 feet square for the whole height then built. The exterior face, to an average depth of sixteen or seventeen inches, was of Maryland marble, usually called alum-stone. The remaining thickness of the walls was of blue-stone rubble backing, not the best construction for a building of such enormous weight.

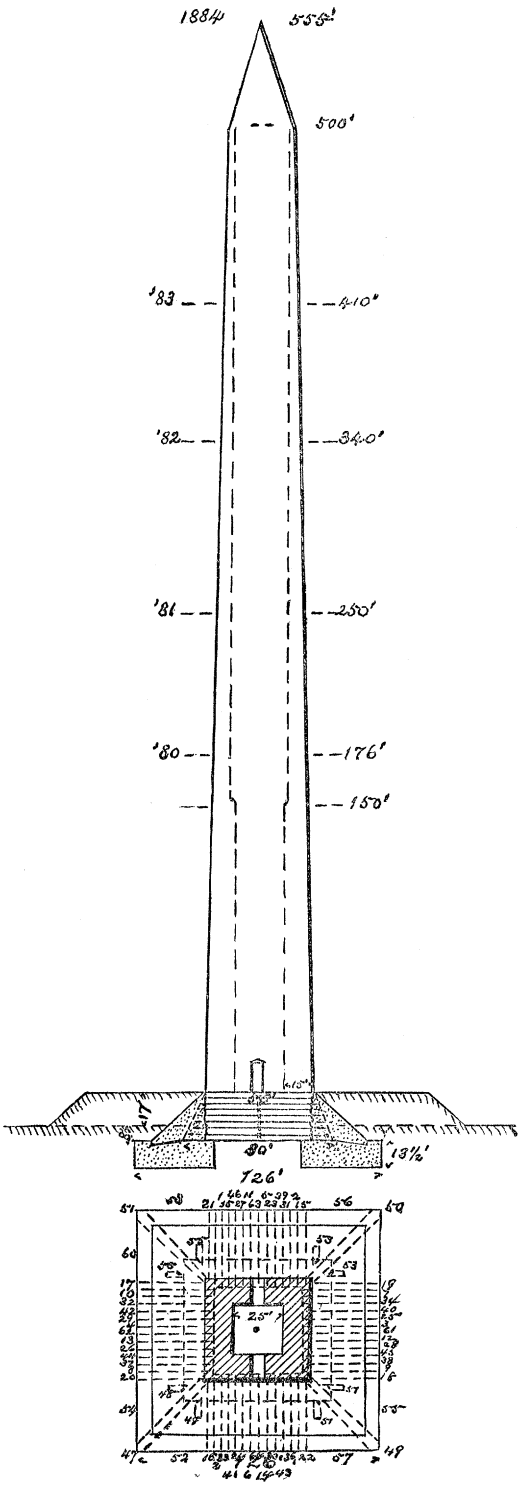
To ascertain the kind of earth that would be under the monument, a well was dug, some 25 feet deep, in the immediate vicinity of the site, and the earth particularly examined. The material was found very compact, requiring a pick to break it up, and was pronounced suitable for a structure of the kind. At a depth of twenty feet a solid bed of gravel was reached, and, six feet lower, water was struck. Before the first course of marble was laid, bench-marks were located from which to test the settlement of the monument. After building to 126 feet in height above the ground, the chairman of the building committee writes,



SECTION THROUGH APEX.



PLAN OF RIBS.



FOUNDATION.
126'

in 1853, 'There is no perceptible settlement' of the base, — a statement which seems hardly accurate, judging from what is usual, and from what appeared later. Here may be mentioned, as of interest later, that the architect, Mr. Mills, in 1848, levelled from the top of the third course or step of the foundation to a point on top of the meridian-stone monument near tide-water, planted by President Jefferson, and thus established a reference by which he might detect any settlement occurring in the progress of the work.

On Feb. 22, 1855, congress having been petitioned for aid, a committee of the house approved of the work done, and recommended an appropriation of $200,000. But this was the period of the Know-nothing excitement; and, on the very day that the appropriation was recommended, the books and papers of the monument society were forcibly seized by adherents of the American party, and a new board was illegally formed from their members. This action again delayed progress, and, during their rule of four years, only four feet were added, bringing the obelisk to the height of 156 feet above the base, at which elevation it long rested. On Feb. 22, 1859, this board was ousted by the incorporation by congress of a new Washington monument society for the purpose of finishing the work. These changes probably account for the more or less complete disappearance of the original plans, measurements, bench-marks, etc., which is afterwards noted. The civil war soon followed, and no actual work was done for many years. The society remained as custodian during this time, and made some attempts to re-awaken public interest. Numerous examinations were made by government officials of the condition of the stone work, which in some places was slightly chipped at the edges by flush jointing, and of the foundation. In April, 1874, Lieut. Marshall found that the axis of the shaft was inclined 1.4 inches to the north-west. At one time it was hoped that the bare shaft might be finished in some form by July 4, 1876; but the unsatisfactory condition of the foundation prevented.

All hope of completing the monument by the centennial anniversary having gone, the matter apparently rested until August, 1876, when an act of congress was approved, providing that there should be appropriated $200,000 in four annual instalments, to continue construction; the officers of the society being required to transfer the property to the United States, and the construction of the monument to be under the direction of the president of the United States, the supervising architects of the treasury and of the capitol, the chief of engineers, and the first vice-president of the monument society. In the examination called for in this act, it was very curiously discovered, by levels taken to what was then supposed to be the meridian-stone previously referred to, that the monument had, in twenty-eight years, settled nearly nine inches into the ground. A lively investigation by those most interested presently developed the fact that Gen. Babcock, when in charge of buildings and grounds in Washington, had, in the course of improvements, graded off and carted away the meridian-stone monument; so that, added to the loss of all plans and details, we must now relinquish all hope of knowing whether the monument had settled or not.

Congress then authorized the re-enforcing of the foundation; and the work was placed in charge of Lieut.-Col. Thomas Lincoln Casey, U.S. engineers, who had devised, and has successfully carried out, the plan shown in the sketch. The earth about the base, some 10,000 cubic yards, was first removed. Then a trench 4 feet wide, 13.5 feet deep, extending 23 feet outside of the old foundation, and tunnelling 18 feet under it, was excavated. The trench was then filled with concrete of four parts broken stone, three parts pebbles, two parts sand, and one part Portland cement, mixed by machinery in a cubical box rotating on a diagonal axis, and then thoroughly rammed in place. When the space under the old foundation was as nearly filled as convenient, more concrete was put into small gunny-sacks, and rammed home horizontally, while yet soft, with a heavy timber. The order in which these trenches were made and filled is numbered on the plan. At first it was intended to make and fill two opposite trenches at the same time; but it was found that removing 144 square feet of the foundation (only 2.5 %) caused a too rapid motion of the column, and, after the first four trenches, but one trench was made and filled at a time. This sensitiveness of the obelisk to disturbance appears to confirm the opinion that the old foundation was already carrying nearly the maximum allowable load.

The effect of cutting these trenches was studied by means of a plumb-line suspended from the top of the shaft, and hanging freely through a graduated metal circle near the floor. The greatest movement at the beginning of the work was $\frac{11}{24}$ of an inch. By careful watching and working, the original deflection of 1.75 inches was almost entirely

corrected. The area of the foundation was increased 150 %, or from 6,400 square feet to 16,000 square feet, and was carried down to 21.5 feet below the original surface of the ground. Careful levels showed, that, during the process of underpinning, the base of the monument settled two inches.

The foundation was further strengthened, and the pressure distributed over the whole of the new base, by placing a continuous buttress of concrete around the base, from the top of the old foundation halfway out on the concrete base; a portion of the foundation masonry being cut away, as shown in the sketch, to give a good bearing. A terrace of earth was afterwards added, to cover the rough masonry, and to still further increase the depth to which the foundation was carried, and thus to increase the resisting-power of the ground against lateral displacement.

The new foundation was completed in May, 1880; and on Aug. 7 President Hayes assisted in laying the first new stone on the shaft. On the new portion the space inside was enlarged from 25 feet square to 31.5 feet square, to diminish the weight by lessening the thickness of the walls; and solid granite backing, in two-feet courses to correspond with the outside marble courses, was substituted for the irregular rubble-work. When the wall grew considerably thinner, marble was used throughout. The thickness at 500 feet is 18 inches. The monument rose 26 feet in 1880, 74 feet in 1881, 90 feet in 1882, 70 feet in 1883, and 90 feet, to which was added the apex of 55 feet, in 1884.

Eight iron columns rise in the interior, shown by small circles on the plan of the top. Four of them are far enough from the wall to support the iron platforms and stairways by which the monument may be ascended: the other four act as guides for an elevator. These columns have been connected with the water-bearing stratum below the monument, and with the metallic point on the apex.

Several ways of capping the monument, or of constructing the apex to suit its exposed position, and secure permanence, were discussed. The adopted design was by Bernard R. Green, civil engineer. Three stone corbels, one foot thick at the edge, begin to grow out from each side of the well within the monument, at a point thirty feet below the top of the wall. They increase in width as they ascend, until at the top of the wall the middle one projects six feet, and the side ones four feet and one-half each. From them spring stone arched ribs, which in turn support the roof-covering of stone slabs seven inches thick. The middle ribs rise thirty feet, and intersect on a cross-shaped keystone; the side ribs abut against one another, and a square stone frame some seven feet lower down. The apex is terminated by an aluminium point.

After the main walls had reached their ultimate height, a frame carrying a derrick mast, which reached to a height of 75 feet, was erected on the tops of the iron columns. An opening was left in the lower roof-course at one side; the stone for the roof run out on a small balcony supported by projecting beams, and then raised to place. When all but three roof-courses were set (in all, some 14 feet in height), a platform was built around the top, supported on brackets resting on the slanting sides of the roof, and carried, in turn, on beams projecting through the apertures for observation left in the lower part of the roof, two on each side; and the nine remaining stones were distributed on this platform. The central derrick was then removed, and a small quadruped derrick erected on the platform and over the point of the roof. Thus these stones, including a cap-stone weighing 3,300 pounds, were readily set, and the apex completed Dec. 6, 1884. A small opening near the top, afterwards closed by a stone slab, permitted the retreat of the workmen who removed the scaffolding.

Since the completion of the foundation, and the resumption of building the shaft, some slight settlement has taken place, increasing regularly and uniformly with each addition of a few courses of stone. After a few weeks from any suspension of building, settlement has always ceased; and hardly a perceptible movement again occurred until after some 200 tons' weight had been added, when the same process of settling was repeated. Altogether, in the addition of 400 feet in height, and about 34,000 gross tons, 12,000 tons of which are in the earth terrace over the foundation, the settlement was two inches. The entire settlement, due to underpinning the foundation and completing the superstructure, is about four inches. The movements of the plumb-lines, of which there were two, — one from the height of 148 feet, and the other from 259 feet, — were but trifling. Changes in them were infrequent, and probably not always, if often, due to actual leaning of the shaft.

The workmen were protected against injury from falling by a strong net suspended around the outside of the shaft; and, since the resumption of construction by the United States, the only accident has been the breaking of the

arm of one of the men. The cost thus far is $1,188,000. The completed structure weighs 81,000 tons.

In this connection, some of the heights of notable structures may be of interest: Tower of Pisa, 179 feet; Bunker Hill monument, 221 feet; Great mosque, Cairo, 282 feet; Trinity spire, New York, 284 feet; Campanile, Florence, 290 feet; top of capitol, Washington, 307 feet; Milan cathedral, 355 feet; St. Paul's, London, 365 feet; Antwerp cathedral, 402 feet; Lutheran Mariankirche, Lubeck, 430 feet; St. Stephen's, Vienna, 441 feet; St. Rollox chimney, Glasgow, 450 feet; Great pyramid, 450 feet (originally 485 feet); St. Peter's, Rome, 455 feet; Strasbourg cathedral, 468 feet; Cologne cathedral, 511 feet; Philadelphia city hall, to be 535 feet; Washington monument, 555 feet.

Many memorial stones were contributed by the states, and by different organizations in this country, and by foreign countries. Some forty of these stones were set in the interior faces. One hundred still remain in the storehouse, and will probably be affixed as slabs to the interior walls in convenient places.

CHARLES E. GREENE.

THE ELECTRIC LIGHT FOR LIGHT-HOUSES AND SEARCH-LIGHTS.

THE recent experiments in England (*Nature*, vol. xxx. p. 362), upon the relative merits of electric, gas, and oil lights for lighthouse illumination, have called attention to the very marked failure of the arc-light to penetrate through a misty or foggy atmosphere; this failure being due to the vigorous absorption of the blue rays of the spectrum by such an atmosphere, — rays in which the arc-light is especially rich. A very striking case of similar failure was presented to the writer's notice a few evenings ago. One of the streets of Washington has recently been lighted by arc-lights on each side, upon posts several feet higher than the gas-lamps; so that, in looking along the street, the rows of electric lights above the gas offer a good opportunity for comparison. For several nights both were lighted; and one of these nights chanced to be extremely foggy for a few hours in the evening, the ground being covered with slush from melting snow. For this reason I went out of my way to see the effect upon these lights, and was rewarded by the sight of the arc-lights — overpoweringly bright close at hand — becoming almost as faint and yellow as the gas-lamps at a distance of less than half a mile. The extent of the arc-lights was only five blocks, and the treasury building at one end, and patent office at the other, prevented a view from a greater distance; but there can be no doubt, that, if the relative rates of absorption had continued in the same ratio for a greater distance, the arc-lights would have appeared fainter than the gas-lamps at a distance of not much over half a mile, and would have entirely disappeared long before the latter. The arc-lights are said by the company to be of about two thousand candle power, and the gas-lights probably equal between fifteen and twenty candles; so that the enormous difference of absorption under these circumstances is evident at a glance. To be sure, this was a very thick fog; but this is the very condition of things where penetrating power is most necessary for lighthouse lamps, and where the arc-light seems to fail utterly.

For search-lights, in naval warfare, as protection against torpedo attack in thick weather, and for other similar purposes, the case is just as bad, or even worse; for the light must traverse the necessary distance twice, — to the dangerous object, and then reflected back to the ship. For determining the best quality of light for submarine search, experiments upon the selective absorption of sea-water for various kinds of luminous radiant energy would seem to be desirable.

Professor Langley has shown, within the last year or two, that our atmosphere absorbs much more of solar radiant energy than has been heretofore supposed, and that this is very largely in the blue end of the spectrum; so that sunlight, if we were rid of our atmosphere, would be much bluer than we see it. He has shown, too, that this takes place by diffusion of the light by reflection in all directions from particles in the atmosphere, so that we get about half our daylight from the sky, even in a perfectly clear day; and that this is the cause of the blue sky.

The same explanation is sufficient to account for all the phenomena of the wonderful red afterglows following the sunsets of a year ago, if we can explain the presence of reflecting particles in a more or less stratified arrangement (Krakatoa dust, very likely) at an unusual height in the atmosphere. These would reflect sunlight to us in much greater amount and for much longer (semi-intermittent) intervals than the ordinary dust and clouds at a lower level of the atmosphere; and this selective absorption would account for the wonder-

ful color, the light growing redder the farther it traversed the atmosphere.

In a recent article[1] Professor Langley states his belief that much of this diffusion of the blue rays, as also the general absorption of the whole spectrum, is due to fine dust-particles in the atmosphere. The very strong absorption of the blue rays of the arc-light by fog would seem to suggest the inquiry whether the average size of the minute water-drops forming this fog has any thing to do with the remarkably selective effect upon the blue wavelengths, or whether this is simply the absorption effect of water *en masse*.

With the failure of the arc-light to penetrate fog comes the natural inquiry, whether the incandescent lamp will be any better for lighthouse and search-light purposes. Now, the part of the solar spectrum most free from atmospheric absorption-lines is in the orange, with part of the neighboring yellow and red; and some experiments have shown that this region — or the yellow part of it, at any rate — is that in which the incandescent carbon filament is especially rich, relatively more so than the solar spectrum, and it is the brightest part of that. So that there would seem to be every probability that the incandescent lamp would prove very effective in fog penetration, perhaps most efficiently so at a slightly lower temperature and brilliancy than the present average. The difficulty for lighthouse and search-light purposes would be in concentrating a sufficient amount of luminous radiating filaments in a very small space near the focus of a lens or mirror, which is a strong point in the effective use of the arc-light. With single-filament lamps this would be impossible; but the writer can see no insuperable difficulty in arranging a whole bunch or cluster of interlacing loops, joined in multiple arc within the same exhausted globe, so as to present almost a complete network of filaments over a vertical projection of an inch or two square, and yet not have them touch each other; unless, indeed, the great heat might soften the globe enough to let it collapse; and this could probably only be determined by experiment. The suggestion that a slightly lower temperature might be about as effective in fog penetration would help a little, but not very much, on account of the rapid decrease of luminosity, with slight fall in temperature. Special care would need to be taken to make each of the filaments of the cluster of equal resistance with the others; but no more so than in any set of lamps on the same circuit, and no doubt all the difficulties could be speedily surmounted. Some experiments upon the fog-penetrating power of the incandescent lamp would certainly seem to be worthy the attention of those engaged in these matters; for there can be no question about the far greater convenience, cleanliness, safety, and reliability, of the incandescent lamp over all others, even if it is not so economical. But in government lighthouses and war-ships the economy is not so important, reliability and fog-penetrating power being the prime requisites. H. M. PAUL.

[1] *Philosophical magazine*, October, 1884.

RECENT DETERMINATIONS OF LONGITUDE ON THE WEST COAST OF SOUTH AMERICA.

THE recent completion of the longitude measurements on the western coast of South America by the U. S. naval officers, under the command of Lieut.-Commander Charles H. Davis, U.S.N., affords a remarkable proof of the accuracy of the methods and instruments now in use for such operations. Lieut.-Commander Davis commenced his measurement in November, 1883, at Valparaiso, and terminated it in March, 1884, at Panama; connecting there with the chain of measurements made in 1875 by Lieut.-Commander F. M. Green, U.S.N., and measuring from Valparaiso to Arica, Arica to Payta, Payta to Panama,[1] and in December, 1883, with the aid of Dr. B. A. Gould, director of the Cordoba observatory, from Valparaiso to Cordoba. This work completes the telegraphic measurement of the polygon Washington–Key West, Key West–Havana, Havana–Santiago de Cuba, Santiago–Kingston, Kingston–Aspinwall, Aspinwall–Panama,[2] Panama–Payta, Payta–Arica, Arica–Valparaiso, Valparaiso–Cordoba, Cordoba–Buenos Aires, Buenos Aires–Montevideo, Montevideo–Rio de Janeiro, Rio de Janeiro–Bahia, Bahia–Pernambuco, Pernambuco–St. Vincent, St. Vincent–Madeira, Madeira–Lisbon, Lisbon–Greenwich,[3] Greenwich–Washington.[4]

This great chain of longitude measurements, consisting of twenty links, closes with but an insignificant discrepancy; the longitude of the Cordoba observatory by way of Lisbon, Rio de Janeiro, and Buenos Aires, being 4 h. 16 m. 48.06 s., and by way of Wash-

[1] Report of the U. S. coast-survey for 1875, appendix No. 11.
[2] Telegraphic longitudes in the West Indies and Central America, Washington, 1877.
[3] Telegraphic longitudes on the east coast of South America, Washington, 1880.
[4] U. S. coast-survey report for 1870.

ington, Panama, and Valparaiso, 4 h. 16 m. 48.24 s., showing a discrepancy of only 0.18 s.

These measurements have, with the exception of those joining Greenwich and Washington (made by the U. S. coast-survey) and those joining Valparaiso and Buenos Aires (made by Dr. B. A. Gould), been made by officers of the U. S. navy, and are homogeneous, each determination being the result of repeated comparisons through a telegraphic line of time-pieces whose errors on local time were ascertained on the same night by careful transit observations.

It will, of course, be understood that the remarkably small discrepancy (0.18 s.) by which this great polygon fails to close is the algebraic sum of all the errors affecting the various longitudes; but its very small amount is an indication of the care and painstaking of the officers whose labors have given this result, as well as of the accuracy of the instruments and methods employed.

In addition to his valuable work between Panama and Valparaiso, Lieut.-Commander Davis has recently determined telegraphically the longitude of Vera Cruz by measuring from Galveston, and has, on the west coast of Central America, furnished the Guatemalan boundary commission with a starting-point by fixing from Panama the longitude of Guatemala City (in co-operation with Mr. Miles Rock). A detailed report of the work of Lieut.-Commander Davis will shortly be published by the U. S. navy department.

THE KILIMANJARO EXPEDITION.

AT a meeting of the Royal geographical society, Jan. 26, Mr. H. H. Johnston gave a description of his visit to Kilimanjaro, on the slopes of which he spent more than five months in the summer and autumn of last year.

Giving a lively and picturesque narrative of his adventures during his stay with Mandara, chief of Moshi, a person of remarkable character, who rules a small tract on the lower slopes of Kilimanjaro at an altitude of about 6,000 feet, and is at war with all the surrounding potentates, Mr. Johnston told how, after some difficulties, he began the ascent of the mountain with forty carriers and some guides, provided by another chief, Maranga. As a good place for settlement close to water, and not too high up, so that his shivering followers might not suffer unreasonably from cold, he selected a grassy knoll, rising above the river of Kilema, which takes its source near the base of Kimawenzi. The altitude of this spot was nearly 10,000 feet. Having seen every one carefully installed and protected from the — to them — severe cold (for the thermometer descended every night to one or two degrees below freezing-point), he transferred his own quarters to a higher elevation, and began industriously to collect.

His first excursion was to the base of Kimawenzi. The terrible hurricane of wind, however, that raged round this jagged series of lava-peaks, prevented him from continuing the ascent, although he doubted if it were possible for any one to reach the summit, owing to the want of foothold. The snow varied very much in quantity on Kimawenzi. Sometimes the whole peak would be covered down to the parent ridge, with only the precipitous rocks peeping blackly through the mantle of white. At other periods the snow would be reduced to an insignificant patch, and the reddish sand which filled the crevices and glissades between the lava-rocks would be left exposed to view. This change from an almost complete snow-cap to nearly no snow at all might be effected in twelve hours.

His great object, however, was to reach the snows, and, if possible, the summit of Kibô. To do this it would be necessary to sleep on the way. He had, therefore, to induce a few followers to accompany him to carry impedimenta. Starting at 9, he walked upwards, with few stoppages, until 1.30. At first they crossed grassy undulating hillocks, the road being fairly easy. Then they entered a heathy tract, scorched and burnt with recent bush-fires; but higher up, where the blaze had not reached, the vegetation was fairly abundant and green. Small pink gladioli studded the ground in numbers. At an altitude of nearly 13,000 feet, bees and wasps were still to be seen, and bright little sun-birds darted from bush to bush, gleaning their repast of honey. A little higher they found warm springs, the thermometer showing the temperature of the trickling mud to be 91° F. Mounting high above the rivulet, the scenery became much harsher. Vegetation only grew in dwarfed patches as they passed the altitude of 13,000 feet, and the ground was covered with bowlders more or less big, apparently lying in utter confusion, and without any definite direction. They were not very difficult to climb over, and even seemed to act as irregular stone steps upwards. In their interstices, heaths of the size of large shrubs grew with a certain luxuriance. About 13,700 feet, he saw the last resident bird, apparently a kind of stonechat. It went in little cheery flocks, and showed such absence of fear, that he had to walk away from it before shooting, to avoid shattering his specimen. After this, with the exception of an occasional great high-soaring kite or great-billed raven, he saw no other bird. On reaching a height a little above 14,000 feet, he stopped again to boil the thermometer and refresh himself with a little lunch. Throughout this ascent, which was easy to climb, he suffered absolutely nothing from want of breath, or mountain sickness; although his three Zanzibari followers lagged behind, panting and exhausted, and complained much of their lungs and head.

"Mounting up a few hundred feet higher than the

Abridged from *Nature*, Jan. 29.

last stopping-place," Mr. Johnston said, "and rounding an unsuspected and deep ravine, I arrived close to the base of a small peak, which had been a continual and useful point to aim at during the whole journey from my station. I was now on the central connecting ridge of Kilimanjaro, and could see a little on both sides, though the misty state of the atmosphere prevented my getting any good view of the country. This ridge, which from below looks so simple and straight, is in reality dotted with several small monticules, and cut up into many minor ridges, the general direction of which is, on the southern side, from north-east to south-west. To the eastward I could see the greater part of Kimawenzi rising grandly with its jagged peaks and smooth glissades of golden sand. Westward I still looked vainly in the piled-up clouds; for the monarch of the chain still remained obstinately hidden, and I was at a loss as to how best to approach his awful crown of snow. At length, and it was so sudden and so fleeting that I had no time to fully take in the majesty of the snowy dome of Kibô, the clouds parted, and I looked on a blaze of snow so blinding white under the brief flicker of sunlight, that I could see little detail. Since sunrise that morning I had caught no glimpse of Kibô, and now it was suddenly presented to me with unusual and startling nearness. But before I could get out my sketch-book, and sharpen my chalk pencil, the clouds had once more hidden every thing; indeed, had enclosed me in a kind of London fog, very depressing in character, for the decrease in light was rather alarming to one who felt himself alone and cut off at a point nearly as high as the summit of Mont Blanc. However, knowing now the direction of my goal, I rose from the clammy stones, and, clutching up my sketch-book with benumbed hands, began once more to ascend westwards. Seeing but a few yards in front of me, choked with mist, I made but slow progress; nevertheless, I continually mounted along a gently sloping hummocky ridge, where the spaces in between the masses of rock were filled with fine yellowish sand. There were also fragments of stone strewn about, and some of these I put into my knapsack. The slabs of rock were so slippery with the drizzling mist, that I very often nearly lost my footing, and I thought with a shudder what a sprained ankle would mean here. However, though reflection told me it would be better to return to my followers, and recommence the climb to-morrow, I still struggled on with stupid persistency; and at length, after a rather steeper ascent than usual up the now smoother and sharper ridge, I suddenly encountered snow lying at my very feet, and nearly plunged headlong into a great rift filled with snow that here seemed to cut across the ridge and interrupt it. The dense mist cleared a little in a partial manner, and I then saw to my left the black rock sloping gently to an awful gulf of snow so vast and deep that its limits were concealed by fog. Above me a line of snow was just discernible, and altogether the prospect was such a gloomy one, with its all-surrounding curtain of sombre cloud, and its uninhabited wastes of snow and rock, that my heart sank within me at my loneliness. Nevertheless, I thought, 'only a little farther, and perhaps I may ascend above the clouds, and stand gazing down into the crater of Kilimanjaro from its snowy rim.' So, turning momentarily northwards, I rounded the rift of snow, and once more dragged myself, now breathless and panting, and with aching limbs, along the slippery ridge of bare rock which went ever mounting upwards. I continued this for nearly an hour, and then dropped exhausted on the ground, overcome with what I suppose was an ordinary attack of mountain sickness. I was miserably cold, the driving mist having wetted me to the skin. Yet the temperature recorded here was above freezing-point, being 35° F. I boiled my thermometer, and the agreeable warmth of the spirit-lamp put life into my benumbed hands. The mercury rose to 183.8°. This observation, when properly computed, and with the correction added for the temperature of the intermediate air, gives a height of 16,315 feet as the highest point I attained on Kilimanjaro. I thus came within a little more than 2,000 feet of the summit, which is usually estimated to reach an altitude of 18,800 feet."

He made other ascents during the month he was in high altitudes. The footprints and other traces of buffaloes were seen up to 14,000 feet; but he never caught sight of one of the creatures, nor did he see any of the big antelope, which also wander up to the snow-line. At a height of 13,000 feet he saw three elephants, and at night the shrill trumpeting of these animals could be heard round the station.

On Oct. 18 he found himself, most unwillingly, obliged to leave the elevated settlement and return to Taveita. The relatively great cold they had experienced had reacted very unfavorably on his men's health, and he feared that a longer delay might render them quite unfitted to carry burdens. He intended, however, to make his return journey entirely through a new and hitherto untraversed country, and this project somewhat consoled him for leaving the summit of Kilimanjaro still unconquered.

Their downward journey, part of the way through trackless bush and dense dank forest, was not without adventure and some reward in scenery of great beauty. The average elevation of this country was between 8,000 and 7,000 feet, and the temperature consequently almost cool, ranging from 43° at night to 70° in the mid-day warmth. After some four hours' walking from their camp, they crossed the long ridge that marked the southern flank of Kimawenzi, and began to descend the eastern slope of the mountain. Soon they emerged on a kind of heath-like country, and then looked forth on a splendid view stretching from Mwika to the mountains of Bura and Ukambani (the Kiulu range), with Jipe on one hand and the river Tzavo on the other. After some enjoyable excursions from his settlement at Taveita, finding that his funds would not support the expedition beyond the end of November, he made a rapid journey to the coast by way of Pare, Usambara, and the Rufu River to Pangani. At Zanzibar, finding there were no fresh funds to enable

him to return to Kilimanjaro, he paid off the last of his faithful followers, many of whom had accompanied Thomson on his great journey, and took his passage on the British India steamer to Suez in quite a sulky frame of mind, as sorry to leave his beautiful mountain as many people are to quit England. Travelling overland from Suez, he arrived in London not much more than six weeks after he had caught his last glimpse of the snows of Kilimanjaro.

PROPOSED EXPLORATIONS IN ALASKA.

SEVERAL expeditions to Alaska are projected during the coming season. Gen. Miles, commanding the military district of which the territory forms a part, desires to acquire a knowledge of the unexplored region between the head of Cook's Inlet and the Tananah watershed. The course of the Tananah is likewise unmapped, except from hearsay, though often traversed by traders in the last fifteen years; so that the opportunity exists here for a fruitful expedition. It is hoped that arrangements may be practicable by which Lieut. Ray, well known for his successful direction of the Point-Barrow party, may be able to command such an exploration. The plan contemplates work either from the Yukon as a base, with a steam-launch and a small party, ascending in June and July, and returning before navigation closes, or an expedition by way of Cook's Inlet, making the portage to the Tananah, and then descending; but a final decision is not yet reached. The party under Lieut. Abercrombie did not succeed in obtaining native assistance, as expected, and were unable to pass beyond the glacier alleged to obstruct the Copper or Atna River about sixty miles from the sea.

Meanwhile, a party has actually started, under Gen. Miles's orders, Jan. 30, for the Copper River, consisting of Sergeant Robinson and F. W. Ficket, signal-observer U.S.A., and commanded by Lieut. Allen. They intend to go to the mouth of the Atna or Copper River by steamer, and ascend as far as possible on the ice, pushing on by water as soon as the ice breaks up and the freshets are over. They hope to cross the divide from the upper Atna, and descend by one of the Yukon tributaries to the mouth of the latter river, and rejoin civilization at St. Michael's. They may be fortunate enough to make the journey in one season, but are prepared to stay two years. They will add a number of Indians to the party at Sitka, and carry various peace-offerings for the Atna Indians.

Lieut. Stoney of the navy is reported to have a new expedition nearly organized to continue his investigations of the Kowak River. The plan adopted, so far as yet decided upon, is to take a steam-launch, ascend the river as far as possible, and pursue the explorations to its source, and winter in the region if necessary. It is stated that the party is to be composed of sixteen men, which is dangerously large, considering the limited food-resources of the region, and might be advantageously diminished by one-half for explorations in the interior. If the party were to pass over the divide, and investigate the course of the Colville, returning *via* Point Barrow next summer, it would accomplish a praiseworthy and much-needed investigation.

THE DOINGS OF ASTRONOMERS.

DIRECTOR HOUGH has continued the work of the Dearborn observatory during 1884 in the same lines as in previous years. Mr. S. W. Burnham has had the use of the great telescope, a refractor of eighteen inches aperture, for observations on double stars; and, in addition to assistance rendered to Professor Hough, he has measured several difficult and interesting binary systems. The observatory has been open on Thursday evenings to members of the Chicago astronomical society, and to astronomical classes from the city high schools; and instruction in theoretical and practical astronomy has been given to the senior class of the Chicago university. The observatory delivers the signals for standard time to the city of Chicago daily.

Professor Hough has employed the great telescope throughout the year, in scientific research, with good results. Thirty-two new double stars were discovered, most of which are difficult objects, and can be observed only when the atmospheric conditions of vision are good. The planet Jupiter has mainly taken his attention, and specially the spots and markings on the disk. The remarkable red spot, first observed in 1878, has maintained its size, shape, and outline, with very slight change, ever since that time. Of late, however, it has experienced a marked change in visibility; which doubtless accounts, in good part, for the statements by other observers with smaller telescopes, that the spot had lost its outline. While from 1879 to 1883 this spot had a retrograde drift in longitude on the surface of the planet, during the past opposition this appears to have nearly ceased. For the rotation period of the planet on its axis, Professor Hough derives 9 h. 55 m. 38.5 s., determined from the mean of six hundred and sixty rotations, and varying only slightly from that for the previous year. The great equatorial belt on the disk of Jupiter is found to be subject to gradual drift in latitude from year to year. Its width has also greatly increased, principally toward the south. A large number of white spots were also observed, of variable visibility, and not absolutely relatively fixed in position. The rate of motion of the envelope in which they are situate, Professor Hough finds to be two hundred and sixty miles per hour, making thus a complete revolution around the planet in about forty-four days and a half. Colored prints of several of the drawings of the planet accompany the report, and are very faithful representations of the salient features of the disk. Delineation with the pencil, however, has been only secondary to the micrometric measurements, of which there are between one and two thousand, fixing with ntire precision the positions of the belts, spots, and more important markings.

Professor Hough and Mr. Burnham made frequent examination of the planet Saturn whenever the best conditions of observation were present. They made a special search for markings on the rings, with negative results. The belts on the ball were very conspicuous, but no marking was seen which could be used in determining the period of the planet's rotation.

The conditions of weather in the spring of the year, so unfavorable elsewhere, prevailed at Chicago; and, in their attempts to observe the satellites of Uranus, the astronomers were rewarded with success in observing these difficult objects on only a few occasions.

From the *Observatory* for February we learn that forty-five chronometers are now on trial at the Royal observatory, Greenwich, for purchase by the admiralty; that the small planets (206) Hersilia and (210) Isabella, which had not been observed since 1879, the year of their discovery, have recently been re-observed; that Herr Palisa of Vienna, the discoverer of small planets, being desirous of raising funds for the intended expedition to observe the total eclipse of August, 1886, desires to sell for two hundred and fifty dollars the right of naming the latest discovered small planet (244); and that Dr. Gill, her Majesty's astronomer at the Cape, has obtained a sum of money from the government grant for scientific purposes, in order to enable him to set on foot a photographic survey of the southern heavens. Mr. C. Ray Woods is proceeding to the Cape for the purpose of taking the requisite photographs, and he also intends to continue the work of photographing the solar corona which he lately undertook in Switzerland, under the direction of Dr. Huggins.

The Rev. S. J. Perry, director of the observatory of Stonyhurst college, communicates to the *Observatory* a summary of his observations of the chromosphere in 1884, with an automatic spectroscope by Browning, having a dispersion of six prisms of 60°. He has found the greater part of the past year favorable for this work. The mean height of the chromosphere, which varied little in 1882 and 1883, attaining its maximum in May of the latter year, fell away rapidly in 1884. A great diminution is also reported in the number of the prominences, and some falling off in their average height. The number of observed displacements of the C line differed but little in the last two years; but the amount of displacement was slight in 1884, compared with 1883. No distortions have been recorded during the past two years so great as those of April and May, 1882.

ROGERS'S HISTORY OF ENGLISH LABOR.

THOSE of our readers who are devoted to political and social science need no introduction to the recent volumes of Mr. Thorold Rogers. It is eighteen years since he published the first two volumes of his history of agriculture and prices, — a work of incalculable value to the critical inquirer. He has since then made an elaborate study of the wages of English labor during the last six centuries, and of their corresponding purchasing-power. The data, which he has collected with marvellous industry, have been printed in part, and in part they still remain in the author's notes. His work is therefore unique. No one, he tells us, has entered on this field of research except himself, and no one has attempted to make use of the data he has published for the purposes which the author has in view; yet, for all his statements, he assures the reader that he can give ample verification. The narrative which he bases upon these inquiries is by no means so statistical as to be dry. The writer is never dull, and is generally entertaining as well as instructive. He brings before the public, information, hitherto hidden, respecting the daily life, needs, burdens, comforts, and helps of the inhabitant of England since the middle of the thirteenth century.

His volume begins with a sketch of English society at that period when the vast majority of persons were engaged in agriculture; and, after devoting six chapters to this introduction, the author proceeds to the subsequent history of wages and labor, and to a consideration of the influence of legislation upon the distribution of wealth. He shows that the evils of pauperism and the degradation of labor were largely due to governmental acts designed to compel the laborer to work at the lowest wages possible. Although this bad legislation has long since been abandoned or modified, the effects remain in England to-day. It will thus be seen that the volumes are a contribution to the historical method of political economy. If the author's figures are correct, and his mode of presenting them trustworthy, it is obvious that he has enabled the statesman and the economist to study the actual results of economic legislation during a period quite long enough to be very instructive. His conclusions have an important bearing upon the spread of communism as well as upon the existence of poverty.

We can perhaps exhibit the tendency of the entire work most readily by giving an analysis of the closing chapter, in which the remedies for present evils are succinctly pointed out.

During the last sixty years parliament has done much toward abrogating severe laws which interfered with the freedom of labor.

Six centuries of work and wages. The history of English labour. By JAMES E. THOROLD ROGERS, M.P. New York, *G. P. Putnam's sons.* 591 p. 8°.

Much more is to be done, especially in sweeping away the distinction of real and personal estate, in forbidding the settlement of land, and by establishing a cheap and compulsory registration of land-titles. There must also be a revision of local taxation. Such changes must be gradual. The remedies for present evils are not to be sought so expectantly in philanthropy as in the modification of laws and privileges. Other countries, as well as England, suffer from bad government, and even the United States is not free from disastrous laws. When government goes beyond its proper function, it makes itself responsible for failures, and engenders the belief, that, if man is unhappy, government has made him so.

The condition of London is then briefly considered, — 'the greatest manufacturing town in the world,' which levies an *octroi* duty on coal to an amount "which seems insignificant, but is sufficient to *kill* such manufactures as depend on its prodigal consumption." Bad as the condition of London labor is, the author is persuaded that it is not so bad as was that of all urban labor sixty years ago, and that the metropolis is not so ignorant or unclean as it was twenty years ago. The unrestricted reception of foreigners is condemned. While approving of charities in extraordinary cases, the author opposes compulsory and governmental charity on a general plan. "To adopt such an expedient would be to despair of the recuperative power of modern industry," and the relief of poverty would soon absorb all the products of labor. Henry George's plan for the nationalization of land is condemned; so is entail. Migration is commended. Small land-holdings are most desirable. The advantages of trade-unions are pointed out with frankness and emphasis. Finally, the author, seeking for measures which will tend toward the just distribution of material comforts, takes courage for the future in the recollection, confirmed by careful historical studies, that England has taught mankind the machinery of government, and that its free institutions, now spreading through the civilized world, depend upon enlightened public opinion. "The reforms which have been effected are the work of the people, and they are to be traced in the stubborn perseverance with which Englishmen have criticised their own condition, and have discovered that from themselves only can the remedy be found."

Before concluding this inadequate notice of a very important book, we may mention that the last eight chapters, comprising the modern facts, have been reprinted by themselves for general circulation. We may also call attention to an elaborate treatise, well adapted to collateral study, on the subject of taxes and taxation in England, — four octavo volumes just given to the public by Stephen Powell, assistant solicitor of inland revenue.

A NEW GEOLOGICAL MAP OF CANADA, WITH AN OUTLINE SKETCH.

This sketch of the physical geography and geology of Canada has been prepared to accompany a new geological map, prepared by the geological survey, in two large sheets on a scale of forty miles to an inch. Both the map and the sketch derive their materials from a review of all the topographical and geological work that has been accomplished in Canada, and give, in graphic and condensed form, a general view of the present state of the physical exploration of the northern part of our continent. The physical geography is not treated with so much attention as it deserves: indeed, the pages of the sketch that are devoted to this subject are more occupied with descriptive than with truly physical geography, and leave much to be said. The geology is given more space, as is natural in the present stage of development of the two studies. Many of its topics will probably continue to excite a controversial interest in the future, as they have in the past: as, for example, the great St. Lawrence and Champlain fault, and its continuation in a series of dislocations "traversing eastern North America from Alabama to Canada," as well as the relation of the formations on either side of it; the Lake-Superior copper-bearing series, which Dr. Selwyn regards as lower Cambrian; the subdivisions of the Archaean, of which only two — the Laurentian and Huronian — are recognized, and even these are not always clearly defined, while the so-called Norian is denied existence in Canada. Intrusive and eruptive masses of Archaean date are properly mentioned with emphasis, although they have "been singularly overlooked or ignored by most writers on American geology." Dr. Dawson's 'western section,' being a region of more recent exploration, has hardly yet reached the controversial stage. His descriptions of the several levels on the plains east of the mountains, and of the little that is known about the northward extension of our Cordilleras, are here presented in good form

Descriptive sketch of the physical geography and geology of the Dominion of Canada. By A. R. C. Selwyn and G. M. Dawson. Montreal, *Dawson bros.*, 1884. 55 p., map in 2 sheets. 8°.

for study by the younger generation of coming geologists, who have yet to begin their acquaintance with the structure of that vast region.

The geological map is a very welcome contribution to our records of the physical history of British North America. It measures the great progress made in western explorations since Sir William Logan and Professor James Hall prepared the well-known map of Canada and the north-eastern United States in 1866, and presents an authorized graphic digest of the many sketch-maps and reports that have been published since that time. Much of the work is, of course, broadly generalized, and is doubtless open to serious changes; but the great features of the country are well represented, and in the west show a very clear continuation northward of those found within our territory, with the addition of certain peculiarities probably dependent on a more extensive glaciation and a greater recent depression in the northern area. The vast breadth of the horizontal mesozoic and tertiary strata of the plains, between the undetermined confusion of the Archaean on the east, and the paleozoic mountain ranges on the west, gives a character to this region that finds no close parallel in other parts of the world.

The 'general map of part of the north-west territories,' prepared at the Dominion lands-office at Ottawa, may be recalled while mentioning the geological sheets. It represents the region northward from our boundary, between Hudson Bay and the front range of the Rocky Mountains, on the same scale of forty miles to an inch, and, in the latest edition we have seen, is corrected to March, 1883. Its topographic detail, especially as regards the ragged outlines of the numerous lakes drained by the Nelson River, is decidedly greater than that of the later geological map. Both are, we presume, in great part only approximations to the exact truth; but, unless the former is imaginary in its details, the uninitiated can hardly understand why it was not used as the base-map for the geological coloring. Perhaps there is need of better co-ordination of government work in Canada as well as with us.

GOODALE'S VEGETABLE HISTOLOGY.

UP to the time of the translation of Sachs's text-book of botany into English, something over ten years ago, comparatively little interest was felt in vegetable histology and physiology in this country; and no modern English treatise on the subject, of any importance, existed. The direction given to the work of students by Sachs's book was soon manifested by a demand for less comprehensive text-books, adapted to the use of more elementary classes; and Thomé, Prantl, Bessey, and Kellerman have successively appeared as the result of this demand.

While the space given to physiological subjects in the earlier editions of Gray was doubtless adequate when these were prepared, the revision of the book required that these subjects should be treated far more comprehensively than was possible within the limits of the original work: hence the appearance of a separate volume allotted to them.

For convenience the author has divided this volume into two parts, devoted respectively to histology and physiology. The first of these has recently come from the press, and sustains the high character of the work of which it forms a part.

An important feature of this volume is the concise introduction, in which the histological appliances and methods most frequently used are brought together for discussion, the writer's long experience as a laboratory teacher making this condensed account of much practical value to the student. Following this are chapters on the cell and its parts; modified cells, and the tissues they compose; the structure and development of the root, stem, and leaf of phaenogams; and the structure and development of the flower, fruit, and seed.

These subjects are treated in much the same manner as in several of the later text-books, though an unusual degree of facility in grouping the topics in a logical manner is shown; and no opportunity is lost of indicating the practical aspects of the subject under consideration.

While this part maintains the conservatism with regard to insufficiently substantiated theories that characterizes the earlier volume of the text-book, it is well abreast of the times in a branch of botany which is admittedly in a far from settled condition. A marked improvement on the usual classification of tissues is observable in the adoption of a smaller number of types, the limits of which are capable of more precise definition, while the treatment of their derivatives is probably the best possible on a morphological basis. A physiological classification of tissues, based largely on the admirable work of Haberlandt, forms

Gray's botanical text-book, sixth edition. Vol. ii., *Physiological botany;* i., *Outlines of the histology of phaenogamous plants.* By GEORGE LINCOLN GOODALE, A.M., M.D., professor of botany in Harvard university. New York and Chicago, *Ivison, Blakeman, Taylor, & Co.*, 1885.

the last chapter, and will be found of much assistance as an introduction to the physiological part of the volume.

In point of illustration, this stands in marked contrast with the more recent American text-books on related subjects. If the figures do not all possess the highest artistic merits, they are for the most part well executed. Their chief value, however, lies in the fact that very few of them have before appeared in American books. Sachs, which has supplied most of our later text-books with their only meritorious histological illustrations, has been practically discarded. While most of the cuts are copies, many of them are taken from special memoirs not readily accessible to the majority of teachers, and hence are as useful as if original; and those that have been reproduced from other sources have the merit of excellence of execution and ready comprehensibility.

If the closing part of the volume, dealing with vegetable physiology, which, as we understand, is soon to appear, shall maintain the character of that already published, the book cannot fail to meet the requirements of the class of botanists for whom the 'Botanical text-book' was planned.

DISEASE-GERMS.

Dr. Klein's book is by far the best we have seen on the subject of the pathogenic and septic bacteria. The author has had a thorough practical education in the matter, as he has worked at it experimentally during the last ten years for the medical department of the local government board of England. In this little volume are embodied his own researches, supplemented by those of others, arranged to form an admirable guide, either for those who may wish to work in this field practically or for those who may wish to get merely a critical knowledge.

The first five chapters are devoted to the apparatus and methods employed in the cultivation of bacteria outside of the body, and the precautions which are necessary in order to avoid error. Also the inoculation of animals, and the care to be taken in this, are spoken of here.

An exhaustive account of the morphological characters of all the micro-organisms is not attempted, but only of such as are related to disease in some way or other.

The classification of Cohn is followed; and the micrococci are first taken up, then the bacteria proper, after this the bacilli, then the vibrios and spirilli, and finally the fungi, including actinomycetes.

The descriptions of the appearance and characteristics of the various species are greatly aided by woodcuts giving the shape and particular way of grouping together. The difference in outline between many of the bacteria is so slight that it cannot be attained in the most highly executed plates: therefore it is much better to try to represent their method of association, and the abundance in which they occur in the tissues, than to strive for great accuracy in the delineation of individuals. The last chapters of the book are well worth reading, as they deal with some of the general questions. That on the relations of septic to pathogenic organisms considers the possibility of certain of the former assuming the properties of the latter under extraordinary conditions. Three examples have been brought forward as proof of this: first, the transformation of the hay bacillus into the bacillus anthracis; second, the properties of exciting inflammation in the eye, which the bacillus subtilis of the air is said to assume when grown in a solution of jequirity-bean (Abrus precatorius); and, third, that the common aspergillus, when cultivated under peculiar conditions, is reported to be fatal when inoculated into rabbits. The facts bearing on these cases are carefully reviewed and tested by his own experiments, and he comes to the conclusion that in each case there is an error. In the first it arises from the accidental contamination of the nutritive fluid; in the second it is not the microbe which is the active agent, but a peculiar chemical ferment (abrin) which is contained in the beans, and has also been obtained from other parts of the plant; and in the third the fungus acts simply mechanically, and not as a toxic agent, in causing death. The septic alkaloids (ptomaines) and the zymogenic ferments are noticed in the chapter on the vital phenomena of non-pathogenic organisms. He takes up the subject of vaccination and immunity, and concludes that the weight of evidence tends to show that the milder form of disease furnishes some substance, not as yet demonstrated, in addition to those already in the system, which acts in preventing the development of the severer forms. In the last chapter, attention is directed to antiseptics;

Micro-organisms and disease. An introduction into the study of specific micro-organisms. By E. Klein, M.D., F.R.S. London, *Macmillan*, 1884. 8°.

The formation of poisons by micro-organisms. A biological study of the germ theory of disease. By G. V. Black, M.D., D.D.S. Philadelphia, *Blakiston*, 1884. 12°.

and it is shown that the greater number simply hinder the development of bacteria, and in no way destroy their powers when they are again placed under suitable conditions.

The little volume may be summed up as clear and concise, well illustrated, and inexpensive.

Dr. Black has adopted a rather high sounding title for a course of lectures delivered to the students in the Chicago college of dental surgery. There is no evidence that he has worked practically at the subject, and the generalizations to which he is inclined have to be made entirely upon the work of others which he has not controlled. He thinks that all the processes causing cell destruction or absorption are a sort of digestion, and that microorganisms act by digesting the cells, or else they are digested by them. Perhaps, if the subject-matter had been a little more digested by the author, he would not have felt himself called upon to publish these lectures.

BILLINGS'S VENTILATION AND HEATING.

THIS book is a reprint, in revised form, of a series of articles which appeared in *The sanitary engineer* in answer to a typical questioner who asked for a rule-of-thumb method for solving problems in ventilation, and who failed to recognize the legitimate relation between 'long-winded discussions on the physics of gases,' and ventilation. The author urges a thorough knowledge of the mechanics of gases, and of the laws involved in their free and constrained movement, as essential to any competent judgment upon the solution of the various pneumatic and thermal problems peculiar to heating and ventilation.

Pecuniary rather than constructive or functional difficulties are stated to be the most serious encountered in providing good ventilation. A partial antidote for scepticism as to the efficiency of any method, because of the frequent entire or partial failure of elaborate and costly systems put to the test of actual use, appears in the description given of systems in successful operation in various types of buildings. If the causes of failure in less successful undertakings had been clearly pointed out, the faith of many would have been still further strengthened. A discussion of the comparative cost of heating, with and without conjoined ventilation, would also have served the good purpose of furnishing needed information, and of allaying any undue apprehension growing out of the author's statements which make ventilation dependent on liberality of expenditure. The ordinary cost of ventilation does not necessarily represent the minimum cost under conditions of maximum economy and efficiency; and it is along these lines that the progress is to be made which shall inspire confidence, and create demand.

The book is a valuable contribution to the literature, rather than to the science, to which it pertains. It furnishes a clear statement of the fundamental principles involved in the art of heating and ventilation, and describes its methods and results in their application to the numerous and varied illustrations cited. In style, the book is fresh, vigorous, and perspicuous; the occasional flashes of the author's individuality lending a charm the more complete because unmarred by dogmatism. Though occasional statements may provoke marginal interrogation-points, the book is an eminently safe guide, and easily takes a leading place among the works of its kind which have appeared in American literature.

Ventilation and heating. By J. S. BILLINGS. New York, *The sanitary engineer*, 1884. 8°.

NOTES AND NEWS.

IT is suggested by G. P. Putnam's sons of New York to secure for the publications of societies the same advantages that are possessed by the issues of publishers, by having them fully described in a priced and classified catalogue, to be made up, say, twice a year, and to be distributed as widely as are the book-lists of publishing-houses. There are at present in the United States some seventy scientific and historical associations which issue in the course of the year transactions, proceedings, or monographs. Many of these publications possess an interest and importance for the general public, and find sale outside of the special circles of the members of the societies for whom they are more particularly prepared. The general sale of such society publications could be materially increased, to the advantage as well of the special interests they are planned to further, as of the various publication-funds, if provision were made for some trustworthy means by which the general public might secure prompt information concerning the works issued, and for some regular channel through which could be supplied the increased demand that such information would unquestionably induce. Each society whose publications are included in the catalogue, will, under the plan proposed, contribute a small annual payment towards the cost of its preparation, while the publishers will assume the payment of such deficiency as may remain.

— D. G. Brinton of Philadelphia announces as in press "The Lenâpé, and their legends; with the com-

plete text and symbols of the Walam olum, a new translation, and an inquiry into its authenticity," by himself.

— At its annual meeting, Jan. 21, the Russian geographical society awarded the Constantine medal to A. Woeikof, for his researches on climatology, especially for his work entitled 'Climates of the globe;' Count Lutke's medal to Col. N. J. Zinger, in consideration of his method of determining time by the observation of two stars, — a method combining accuracy with simplicity without the aid of heavy instruments, and especially suitable for geodetic work (it has already been used in Caucasus, Bulgaria, and other places); the medal of the ethnological section to P. W. Schein, for his study of the folk-lore of White Russia; the medal of the statistical section to Prof. T. Janskeel, for his report on factory statistics of the Moscow region. Inferior gold medals were given to Putkata, Iwanow, and Benderskiy (Ramir travellers); to Professor Klossowsky, for his studies of thunder-storms in Russia; and to Professor Zomakion, for magnetic observations at Kasan in 1882–83 on the international plan. The most important recent publications of the society are the map of the Baikal by Chersky, and the atlas showing Gen. Kaulbars's work on the Amu Sarja.

— Among the prominent members of the Russian geographical society who died during the past year was Count A. S. Uwarow, one of the first archeologists of Russia, and founder of the Archeological society of Moscow. His first work was an investigation of the archeology of southern Russia. Later he made a very thorough examination of the tumuli on the Oka (Wladimir), and published an important work on the Finnish people of the Meria, who inhabited the country before its colonization by the Russians. For this work he was awarded the Constantine medal of the society. The last fifteen years of his life were devoted to the study of prehistoric archeology.

— The electrical exposition, organized by the International society of electricians at the Observatory of Paris, will open March 15. The exposition will be the first in a series of special expositions preparatory to the great universal and international festival in 1889.

A KANSAS TORNADO IN APRIL, 1884.

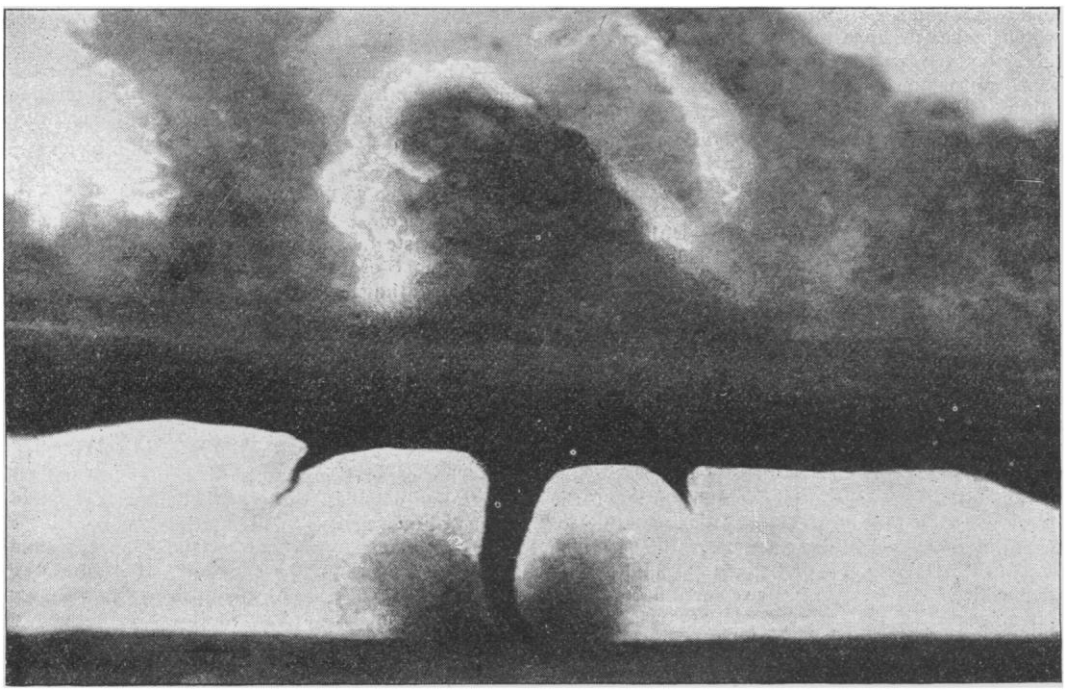
— Capt. Mitchell of the English steamer Wentmore reports that on Jan. 28, at half-past two A.M., a ball of St. Elmo's fire fell between the bridge and foremast, and afterwards played upon the foremast and gaff. This ball of fire was so bright that for a time it blinded the officer on watch.

— Ambulance classes for railway employees have been instituted in Berlin, and it is intended that in future every German railway official shall be an accomplished student of the Esmarch ambulance system.

— Mr. Cochery, the French minister of posts and telegraphy, was present at Rouen, Jan. 2, at some experiments in long-distance telephoning. The object was to test the application between Rouen and Havre, a distance of about ninety kilometres, of the simultaneous transmission system of Van Rysselberghe. The result was excellent, and Cochery announced that the communication would be open to the public in a fortnight. It is probable that before long there will also be a connection between Rouen and Paris, using either the Van Rysselberghe system or a special wire, according to the cost. Since Jan. 1 the first public telephone-offices have been in operation in Paris.

— The January number of the *American meteorological journal*, edited by Professor Harrington of Ann Arbor, Mich., and published at Detroit, is of more than usual interest. Among the meteorological papers, one by Mr. H. H. Clayton, jun., on the 'Thunder-squalls of July 5, 1884,' is of much value. A new feature that appears in this number of the journal is twelve pages of methodical review by various contributors. If extended and continued, this will form a current bibliography of great value to many readers who are unable to consult a large variety of publications. The number contains a woodcut (here produced) prepared from a photograph of a tornado that occurred in Kansas last April. The view was taken by Mr. A. A. Adams, Garnett, Kan., from whom copies may be bought. Another tornado photograph was taken in Dakota last August by F. N. Robinson of Howard, Miner county, from whom copies may be obtained. The storm passed twenty-two miles west of that town, moving in a

south-easterly direction. It was first noticed at four o'clock, and remained in sight over two hours. Several persons were killed, and all property was destroyed along its track. This view has already been published in *Nature* and in the *Comptes rendus*, while its appearance here has been delayed on account of its having been copyrighted. Although the destructive effects of tornadoes have often been photographed, we believe these are the first views ever taken of the tornado itself. No others of the kind are found in the great collection of tornado illustrations in the U. S. signal-office at Washington. It is due to our readers to say that our knowledge of the authenticity of these two views depends simply on the tacit guaranty given by their owners, and that the second one especially bears evidence of having been somewhat 'touched up;' but, in any case, they are certainly unique. It is to be hoped that there may be additional examples reported of this new use of the camera before the coming season is over.



FROM AN INSTANTANEOUS PHOTOGRAPH OF A TORNADO IN DAKOTA.

— The veteran Chevreul, who is approaching the close of the hundredth year of his age, presided the first week in January, in Paris, at a meeting of the new Student's association. It is needless to say that he was enthusiastically received. He spoke of himself as being still merely a student.

— The government astronomer of the colony of Victoria has recommended that a party be sent to New Zealand next September to carry out the necessary physical and other investigations for which the eclipse of the sun in that month will present a favorable opportunity. "The occurrence," he says further, "of long-continued earthquake disturbances in Tasmania during the past year, and the tendency they have lately exhibited to extend to the southern part of Australia, coupled with the probability that they are indicative of a new centre of seismic-action not very far removed from the eastern portion of Bass's Straits, suggest the propriety of establishing some seismometer apparatus at our observatory; and I have now under consideration the question of the form of apparatus best suited for this locality."

— Mr. Lauth, the superintendent of the porcelain factory at Sèvres, is said to have discovered a new porcelain which is far superior to the celebrated old Sèvres. After ten years' experiment and investigation, he thinks he has produced a porcelain identical with that of China. Not only does it lend itself to artistic decoration, but it takes all kinds of glazes, and surpasses in beauty the colors obtained in China.

— Our imperfect knowledge of the more obscure forms of marine life is shown by the fact that a new parasitic copepod has just been discovered in the gill-tubes of the ordinary clam (Mya arenaria), and described in the *American naturalist* for February. It is rather large, and belongs to the group Poecilostomata. The male is found in a free state in the mantle cavity.

— The first part of the new 'Journal of the New-York microscopical society' has appeared as a well-printed octavo of thirty-two pages. It is to contain the transactions and proceedings of the society, and to be published in nine monthly numbers, from November to July inclusive, at one dollar per annum. The present number contains an abstract of Stein's article on electrical illumination for the microscope, which appeared in the *Zeitschrift für wissenschaftliche mikroskopie;* a short critical essay on pollen-tubes, by Dr. Britton; the report of the proceedings of the society; and, finally, an 'Index to articles of interest to microscopists.' From the examination of the journal, we conclude that the society opens its career with good prospects; and we find among the members a number of familiar and esteemed names, which makes us hope that it will prove something more than an association of *dilettanti.* Cornelius van Brunt is president of the society, and B. Braman editor of the journal.

— The *Deutsche geographische blätter* of Bremen publishes a 'sociological essay' on the Kongo tribes, written by Mr. R. C. Phillips, an old resident at Ponta da Lenha. The writer deals more especially with the social condition of the tribes with whom he was brought into contact, and only incidentally enters into questions of commerce and international policy. What he says about the recent 'annexations' and purchases of land by the International association, the French, and the Portuguese, is of some interest just now. It is quite clear that the native chiefs, when they signed the documents so ostentatiously made public, never meant either to 'sell' the land of their tribes, or to place themselves under the sovereignty or protection of foreign powers.

— The following three monographs, part of the larger work on the fauna and flora of the Bay of Naples and the neighboring coasts, will shortly be published by Engelmann of Leipzig: 'Doliolum,' by Dr. Basilius Uljanin, with twelve colored lithographs, ten zincographs, and a woodcut; 'Polycladae,' by Dr. A. Lang, with fifteen lithographs; 'Cryptomeniaceae,' by Dr. G. Berthold, with eight colored lithographs.

— The eighteenth volume of the new edition of the 'Encyclopaedia Britannica' is to be published this month. It opens with the article 'Ornithology,' of Prof. A. Newton: and among the other scientific articles are 'Oysters,' by Mr. J. I. Cunningham; 'Pacific Ocean,' by Mr. J. Murray; 'Parasitism,' treated under the three heads, 'animal,' 'vegetable,' and 'medical,' by Mr. P. Geddes, Mr. Milne Murray, and Dr. C. Creighton; 'Pathology,' by Dr. Creighton; 'Photography,' by Capt. Abney; and 'Phrenology,' by Professor Macalister. 'Philology' is dealt with by Professor Whitney of Yale, and Prof. E. Sievers of Tübingen.

— The fourth edition of 'Tables, meteorological and physical,' by Professor Arnold Guyot, has just been published by the Smithsonian institution. The preceding or third edition was published in 1859; and though stereotyped, it was thought advisable to have this new edition entirely reconstructed. It now forms an octavo volume of seven hundred and sixty-three pages, and is offered for sale at the price of three dollars. The first series of tables (fifteen in number) embraces thermometrical comparisons and conversions; the second (of thirty-three tables), hygrometrical computations; the third (of twenty-seven), barometrical tables; the fourth (of twenty-six), hypsometrical tables; the fifth, geographical tables of conversions, including forty-nine tables of measures of length (for heights, etc.), ten tables of itinerary measures, and ten tables of square measures, or measures of geographical surface; the sixth (of ninety-nine), tables for corrections of variations of temperature, etc., at different parts of the earth; the seventh and last series (of nine tables) embraces miscellaneous tables.

— The brothers Donhardt have reached Zanzibar, and will continue the explorations in the interior of eastern Africa, which they began in 1878 and 1879.

— The International association has sent out an officer to open a station between Karema, on Lake Tanganyika, and the station at Stanley Falls, on the Upper Kongo. A transcontinental route will then be opened by steamer up the Zambezi and Lake Nyassa, across the Stevenson road to Lake Tanganyika, thence by the new station to Stanley Falls, and so down the Kongo.

— The two Austrian explorers, Dr. von Hardegger and Professor Paulitschke, have sailed from Trieste for Aden, whence they mean to go to Harar, and make scientific studies, and collect specimens between there and Sela.

— The general geographical conference of the Australian colonies, to be held at Melbourne, is to discuss the necessity of defining the exact meaning of the geographical term 'Australasia,' the compilation of a reliable work on the geography of Australia for Australian schools, the New-Guinea exploration, and the discovering and defining of the exact boundaries of what may now be termed 'British New Guinea.'

— It is stated in the anthropological notes of the *Athenæum*, that Deniker's study of the Kalmucks, which has appeared in the last five numbers of the *Revue d'anthropologie*, is now complete. He remarks that in Russia, as in China, the Kalmucks are little by little losing their originality, though not so quickly as some other peoples; and that the time is not far distant when there will only remain of this ancient and warlike people, which has its own literature, religion, and laws, some thousands of peaceable subjects whose physical type will perhaps be all that will be left to prove their Mongolian origin. In sooner or later absorbing themselves into the rest of humanity, however, they will certainly add to the mass some traits of character distinctively their own. The same author has also published an investigation into the foetus of the gorilla; a specimen of which, the only one which has ever reached Europe, is in his hands, and has been described by him to the Society of anthropology of Paris.